Space Weather Technical Forecast

Issued on Wednesday, 06 March 2024 at 13:21 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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The planned NOAA SWPC data outage on 6th March between 1600 UTC and 2200 UTC has been postponed until further notice. This was due to impact most of our observational data feeds and some models.
https://www.swpc.noaa.gov/news/postponement-planned-network-outage.

Space Weather Forecast Headline: Chance of G1/Minor Storms on day 3 (08 Mar) given likely HSS arrival.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Low solar activity throughout. There are eight sunspot regions on the visible disc, with AR3595 approaching the western limb and AR3596 increasingly fading. AR3599 continues to be the most magnetically complex, with continued slight development with the trailing portion. The remaining regions small and generally stable.

No further Earth-directed CMEs have been observed in available imagery, although modeling ongoing for a filament lift off in the southeast disk later on the 05 Mar.

Solar Wind / Geomagnetic Activity: Solar wind parameters observed primarily by ACE at L1 have averaged around 380-440km/s. Density has been mostly below average. Total magnetic field strength has been weak throughout +4/+8nT. The north-south component has varied weakly throughout between +5nT and -6nT. Phi angle has been primarily negative (away from the Sun) but with brief positive intervals. Geomagnetic activity was Quiet to Unsettled (Kp1-3).

Energetic Particles / Solar Radiation: GOES18 high energy (greater than 10MeV) proton flux was at background levels. High energy electron flux (greater than 2MeV) observed at GOES16 was predominantly at background levels with the associated 24 hour fluence well below the Active (1e8 integrated pfu) threshold. The observed 24-hour fluence was level at 06/0000UTC was 1.23e6 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Expected to remain generally low with a slight chance of an isolated M-class flare.

Solar Wind / Geomagnetic Activity: A CME was observed to depart the southwest of the Sun on the 03 Mar and may glance the Earth with impacts possible on day 2 (07 Mar), although this is low confidence. Otherwise solar winds are anticipated to erratically decline towards slow-ambient during the remainder of day 1 (06 Mar). A negative polarity coronal hole currently near centre disc is then forecast to connect with Earth into day 3 (08 Mar) and persist into day 4 (09 Mar) with solar winds perhaps reaching elevated levels.

Generally Quiet to Unsettled geomagnetic activity is forecast to continue during days 1-2 (06-07 Mar), with a chance of Active intervals and a slight chance of a G1/Minor Storm into day 2 (07

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Mar) given the potential for glancing CME influence. Into day 3 (08 Mar) generally Unsettled conditions expected with Active intervals likely and a chance of G1/Minor Storm intervals in association with the arrival of the HSS, before conditions likely ease into day 4 (09 Mar).

Energetic Particles / Solar Radiation: GOES18 high energy proton flux is expected to persist at background levels. GOES16 high energy electron flux is expected to remain at mainly background levels, with the associated 24hr fluence remaining well below the Active threshold.

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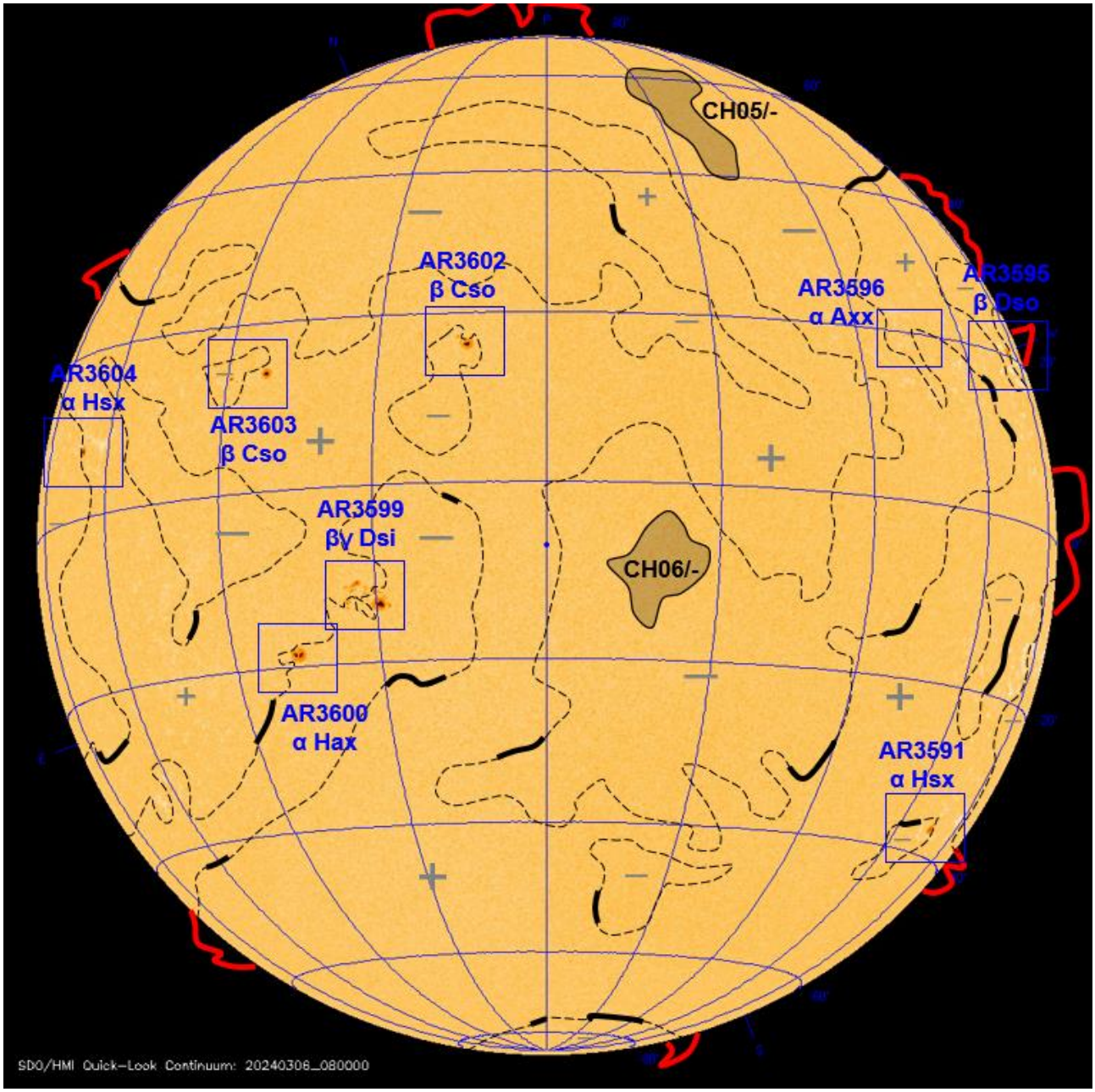
Figure 1. Solar Analysis Valid 06/0800UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

A CME, originating near AR3591, was observed to depart the southwest of the Sun on the 03 Mar and may glance the Earth with impacts possible on day 2 (07 Mar), although this is low confidence. No other CMEs are currently forecast to affect the near Earth environment, although modeling ongoing for a filament lift off in the southeast disk later on the 05 Mar.

Otherwise the Earth is in a slightly elevated solar wind environment following recent CME influence. Solar winds are anticipated to erratically decline towards slow-ambient during the remainder of day 1 (06 Mar). The CME from 03 Mar may provide a glancing blow later into day 2 or day 3 (07-08 Mar) although this reasonably low confidence. A negative polarity coronal hole currently near centre disc is then forecast to connect with Earth into day 3 (08 Mar) and persist into day 4 (09 Mar) with solar winds perhaps reaching elevated levels although confidence is reduced as this feature was not present on the previous rotation. Geomagnetic activity from this feature could see a greater risk for a strong connection as Earth moves closer to the March equinox.

Generally Quiet to Unsettled geomagnetic activity is forecast to continue during days 1-2 (06-07 Mar), with a chance of Active intervals and a slight chance of a G1/Minor Storm into day 2 (07 Mar) given the potential for glancing CME influence. Into day 3 (08 Mar) generally Unsettled conditions expected with Active intervals likely and a chance of G1/Minor Storm intervals in association with the arrival of the HSS, before conditions likely ease into day 4 (09 Mar).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	10	25	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
03/1730	Partial	Filament	SW	500km/s	07/0600UTC	Low confidence glancing blow

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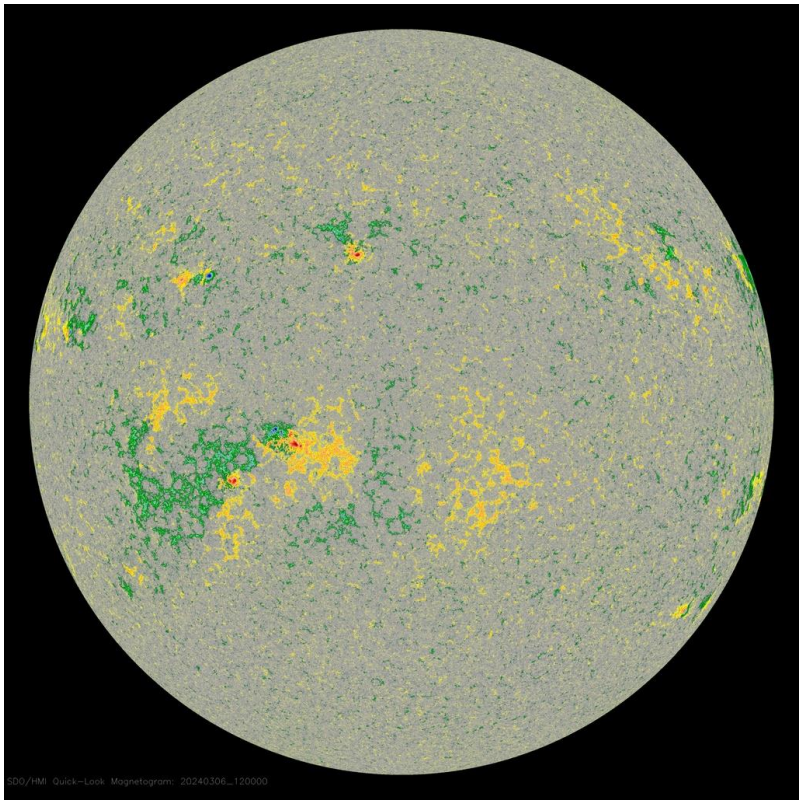
Radio Blackouts - X-Ray Flares:
Low activity is expected, with a slight chance of isolated Moderate activity maintained throughout. The current most likely source of flare activity, AR3399, remains on the visible disk throughout. AR3595 will leave the visible disk later day 1 (06 Mar) with the risk of flares from this region reducing into the period. Far side soundings do not currently suggest any major oncoming regions expected during the period.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	20	20	20	20
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 2: 06/1200UTC HMI magnetogram image



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Solar Radiation Storms - (High Energy Protons):

GOES-18 proton flux is currently at background levels, and is expected to remain so through the period in the likely absence of significant western hemisphere sunspot activity.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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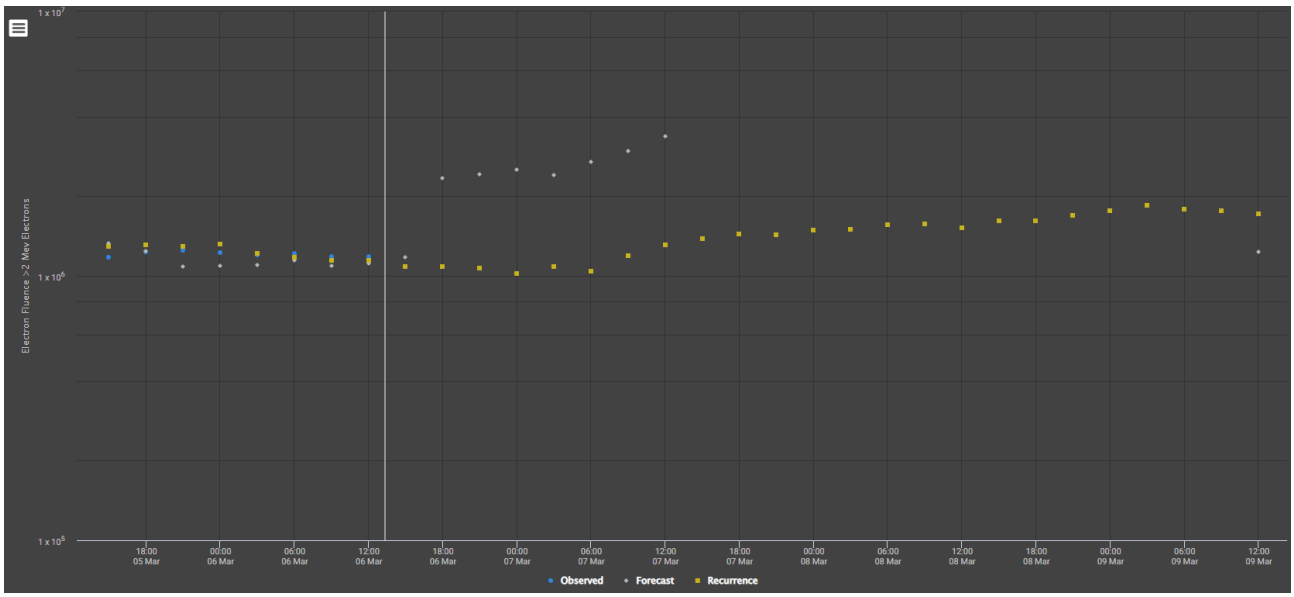
High Energy Electrons Event (≥ 2MeV):
High energy electron flux (greater than 2MeV) remains at background levels despite CME influence in recent days and it expected to generally remain so through much of the forecast period. Any enhancement as a result of CME or coronal hole high speed stream influence are likely to be towards the end of this four-day guidance period.
Consequently, the electron fluence is expected to remain well below the Active threshold with MOSWOC REFM model output viewed as providing reasonable guidance.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	5
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 3: Latest MOSWOC REFM model output



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